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## REMARKS

The Applicants respectfully request reconsideration of this application in view of the above amendments and the following remarks.

**35 U.S.C. §103(a) Rejection – Bershad, Amano, Hosur**

The Examiner has rejected claims 1, 5-9 and 13-15 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent Application Publication No. 2002/0093919 by Bershad et al. (hereinafter "Bershad") in view of U.S. Patent No. 4,951,269 issued to Amano et al. (hereinafter "Amano"), in further view of "Wavelet Transform Domain Adaptive FIR Filtering" by Hosur et al. (hereinafter "Hosur").

Claim 1 pertains to:

*"A method comprising:*

*transforming a signal from a time domain to a transform domain with a wavelet transform;*

*adapting a first adaptive filter in the transform domain based on the transformed signal;*

*estimating a delay of an impulse response based on the adaptation of the first filter;*

*delaying a signal based on the estimated delay; and*

*adapting a second adaptive filter in the time domain based on the delayed signal".*

Notice that the delay is estimated based on the adaptation of the first filter, which was adapted in the **transform** domain. Also, notice that **two filters** (not just one) are adapted. In particular, the first filter is adapted in the **transform** domain, and the second filter is adapted in the **time** domain.

Applicants respectfully submit that Bershad, Amano and Hosur should not be combined, and that any combination does not render these limitations obvious.

Bershad discusses fast converging affine projection based echo cancellers for sparse multi-path channels. FIG. 3 of Bershad is a diagram illustrating an AP-based echo canceller. FIG. 3 includes an adaptive filter 310 and an adaptive filter 330. However, both the adaptive filter 310 and the adaptive filter 330 adapt in the time domain.

Amano discusses an echo canceller with a short processing delay and decreased multiplication number. See e.g., the Title. FIG. 1 is a block diagram showing the general structure of an echo canceller. As shown in FIG. 1 and discussed at column 8, lines 9-52, the echo canceller includes in part a 1<sup>st</sup> 2N'-points fast Fourier transform (FFT) 11, a finite impulse response (FIR) filter 12, a 2N'-points inverse fast Fourier transform (IFFT), and a delay circuit 18.

However, Amano discusses using one single filter, namely the FIR filter 12 in FIG. 1. There is no disclosure or suggestion that the single FIR filter 12 could or should be used in a two-filter approach like that disclosed in Bershad. Furthermore, Amano does not disclose that adaptation of the single FIR filter 12 be used to estimate a delay of an impulse response. Rather, Amano discusses that the single FIR filter 12 be used to estimate the echo signal that is subtracted from the actual echo signal.

The Examiner has asserted that *"it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the teachings of Amano in Bershad for the purpose of 'reducing calculations'"*. See e.g., page 3 of the present Office Action. Applicants respectfully disagree.

Each of Amano and Bershad is complete and functional in itself. Accordingly, there would be no reason to use parts of Amano in Bershad. There is insufficient nexus to connect the approach of Amano with the approach of Bershad in order to arrive at the Examiner's proposed combination. Furthermore, modifications not taught in the prior art would seem to be needed in order to make the combination proposed by the Examiner.

Furthermore, there is no disclosure or suggestion in either reference that the FIR filter 12 would be useful for **estimating the delay** of an impulse response in the two-filter approach of Bershad. **Delay estimation** is not a prior art **established function** of the FIR filter 12 of Amano. Since neither reference establishes that the FIR filter 12 of Amano can be used to estimate a delay, it would not be obvious to substitute it for the time-based filter used in Bershad for estimating delay.

Furthermore, Amano does not disclose that calculations would be reduced if the FIR filter 12 were used to estimate the delay in a two-filter approach like that disclosed in Bershad, as asserted by the Examiner. Claim 1 makes it clear that the signal is transformed with a wavelet transform, however Amano uses a different, fast Fourier transform (FFT). Different transforms have different characteristics. Some transforms work well at estimating delays and others work poorly. It is not clearly established that calculations would be reduced if the FIR filter 12 were used **just to estimate the delay** in the two-filter approach of Bershad and then an additional time adaptation as disclosed in Bershad was also performed. Applicants note that Amano doesn't seem to disclose the "partial" aspect disclosed in the present patent application which helps to reduce calculations when estimating delay.

Furthermore, Amano discloses that frequency domain adaptive filtering is superior to time domain adaptive filtering concerning the computations required. See e.g., column 1, lines 11-14. This seems to suggest that adding a time adaptation as discussed in Bershad to the frequency adaptation discussed in Amano would increase calculations. In other words, Amano's disclosure itself seems to teach away from the Examiner's proposed combination of Amano's frequency adaptation with Bershad's time adaptation. However, the inventors recognize that the approach disclosed in the present patent application may reduce calculations.

Applicants respectfully submit that Hindsight based on statements in the patent application cannot be the reason for combining references. The patent application cannot be used as a guide or roadmap for creating hindsight obviousness.

Furthermore, claim 1 recites that the signal is transformed with a wavelet transform. However, Amano discusses using a fast Fourier transform (FFT). The Examiner has asserted that it would have been obvious to use the wavelet transforms discussed in Hosur. Applicants respectfully disagree. Hosur does not disclose that the wavelet transforms be used to estimate a delay of an impulse response in a two-filter approach like that disclosed in Bershad. There is insufficient nexus to connect Hosur with the approach of Bershad. Hindsight based on statements in the patent application cannot be the reason for combining references. The discussion above is pertinent to this point.

For at least one or more of these reasons, claim 1 and its dependent claims are believed to be allowable over Bershad, Amano and Hosur.

Independent claim 9 and its dependent claims are believed to be allowable over Bershad, Amano and Hosur for one or more similar reasons.

### 35 U.S.C. §103(a) Rejection – Bershad, Amano

The Examiner has rejected claims 16, 20-26 and 28-29 under 35 U.S.C. §103(a) as being unpatentable Bershad in view of Amano.

Claim 16 pertains to:

*"An apparatus comprising:*

*a signal transformer to transform a signal in a time domain to a transformed signal in a transform domain;*

*a first adaptive filter in communication with the signal transformer, the first adaptive filter to adapt based on the transformed signal in the transform domain;*

*a delay estimator in communication with the first adaptive filter, the delay estimator to estimate a delay associated with an impulse response based on the adaptation of the first adaptive filter;*

*a delayer in communication with the delay estimator, the delayer to delay a signal in the time domain based on the estimate of the delay; and*

*a second adaptive filter in communication with the delayer, the second adaptive filter to adapt in the time domain based on the delayed signal”.*

Bershad and Amano do not disclose these limitations or render them obvious. The discussion above is pertinent to this point.

For at least one or more of these reasons, claim 16 and its dependent claims are believed to be allowable over Bershad and Amano.

Independent claims 26 and its dependent claims are believed to be allowable over Bershad and Amano for one or more similar reasons.

#### **35 U.S.C. §103(a) Rejection – Bershad, Amano, Hosur & Ho**

The Examiner has rejected claims 3-4 and 11-12 under 35 U.S.C. §103(a) as being unpatentable over Bershad, in view of Amano and Hosur, and in further view of “Rapid Identification of a Sparse Impulse Response Using an Adaptive Algorithm in the HAAR Domain” by Ho et al. (hereinafter “Ho”).

As discussed above, Bershad, Amano, and Hosur should not be combined. For at least this reason, Applicants elect not to address other aspects of the rejection of these dependent claims.

#### **35 U.S.C. §103(a) Rejection – Bershad, Amano & Ho**

The Examiner has rejected claims 17-19 and 27 under 35 U.S.C. §103(a) as being unpatentable over Bershad, in view of Amano and Ho.

As discussed above, Bershad and Amano should not be combined. For at least this reason, Applicants elect not to address other aspects of the rejection of these dependent claims.

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**Conclusion**

In view of the foregoing, it is believed that all claims now pending patentably define the subject invention over the cited art of record and are in condition for allowance. Applicants respectfully request that the rejections be withdrawn and the claims be allowed at the earliest possible date.

**Request For Telephone Interview**

The Examiner is invited to call Brent E. Vecchia at (303) 740-1980 if there remains any issue with allowance of the case.

**Request For An Extension Of Time**

The Applicants respectfully petition for an extension of time to respond to the outstanding Office Action pursuant to 37 C.F.R. § 1.136(a) should one be necessary. Please charge our Deposit Account No. 02-2666 to cover the necessary fee under 37 C.F.R. § 1.17 for such an extension.

**Charge Our Deposit Account**

Please charge any shortage to our Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Dated: 4/7/08

By Brent E. Vecchia  
Brent E. Vecchia, Reg. No. 48,011  
Tel.: (303) 740-1980 (Mountain Time)

1279 Oakmead Parkway  
Sunnyvale, California 94085-4040

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